CSIR-National Metallurgical Laboratory
Jamshedpur, India

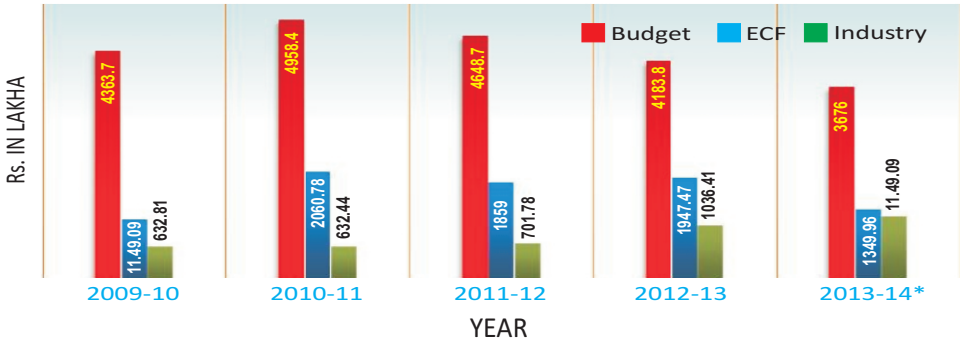
From the Director's Desk

Chairman & Members of the Research Council, Invitees and Dear Colleagues,

It is my honour to convene this 1st meeting of the newly constituted Research Council and my privilege and pleasure to welcome the Chairman Shri Hemant Nerurkar and members of the newly constituted Research Council to the 65th Research Council Meeting of CSIR-NML. Although the Chairman and several members of the research council continue from the previous Council, we have the benefit of some new members in this council. I specifically wish to welcome our new members, Dr S S Mohanty, Director Technical, Steel Authority of India Ltd., Dr Amol Gokhale Director DMRL, Dr Om Prakash BOEING India, and Dr Kamal Dasgupta, Ag. Director of CGCRI and look forward to their valuable guidance in realizing the goals and mandate of the laboratory and taking CSIR-NML forward. For the information of the new Research Council, I wish to re-emphasize our mandate, vision and goals. When our first Prime Minister Pt. Jawaharlal Nehru inaugurated this laboratory on the 26th of Nov. 1950, he had these words to say "I think of the combination of this laboratory with the steel works in this city, of the marriage of science with industry for the progress of both...". The marriage of Science with Industry for the progress of both has since remained the mandate of our laboratory and we have remained committed to this path for the past sixty four years. When I assumed this office in March 2010, my Vision for CSIR-NML was to take this further and redefine it in today's context. Today, our vision of CSIR-NML is a self sustained technology centre in the areas of minerals, metals and materials by 2022. We have since given a definite shape to this vision by defining quantified goals and charted out a roadmap to achieve it. Since my term at office is until 2016, we set ourselves the following short term targets for 2016 :

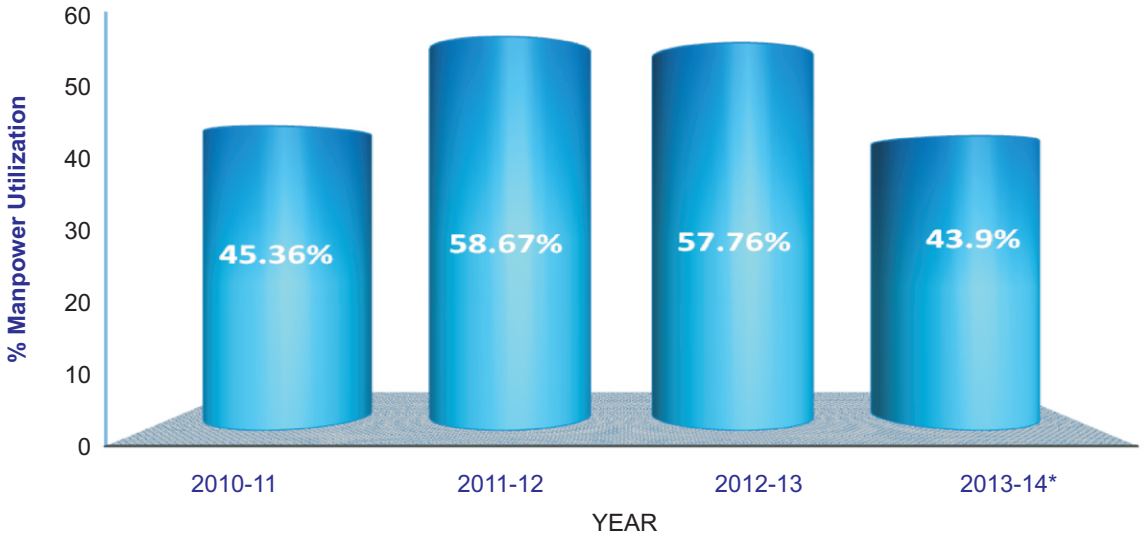
- Achieve 50 % of NML's total budget from industrial sponsorship
- Achieve 80% direct utilization of man-power and major equipments
- Develop and commercialize at least five technologies that will have a lasting impact
- Realize 5% of operational budget from IP licensing and royalties
- Move towards a paperless NML
- Deliver on one national mission project
- Produce 20 PhDs/year from CSIR-NML through AcSIR
- 150 SCI publications/yr with an average citation of 8/paper

At the outset, I would like to brief the Research Council on where we stand with respect to these targets. I have projected below the status pertaining to our earnings from industrial projects vis-à-vis our budget :



We had planned to achieve the target of meeting 50% of the budget from industrial sponsored projects through a phased reduction of expenditure as well as a progressive increase in industrial funding. Despite the increase in the Salary budget as well as the depreciation of the Rupee and inflation, in the past three years, we have managed to decrease our expenditure by about 5% every year. Last year, we have initiated a few drastic measures towards reduction in expenditure and we hope that we would be able to achieve a 10% reduction in the expenditure next year. Our strong focus and emphasis on industry sponsored projects has been very rewarding. We could enhance our industrial External Cash Flow (ECF) from 6.32 Crores (14.5% of budget) in 2010-11 to 12.15 Crores (33%) thus far (Dec 2013) in 2013-14 which is very significant. I have no doubt that we would be able to meet our target of 50% by 2016 if we stay this course and my colleagues are firmly committed to it.

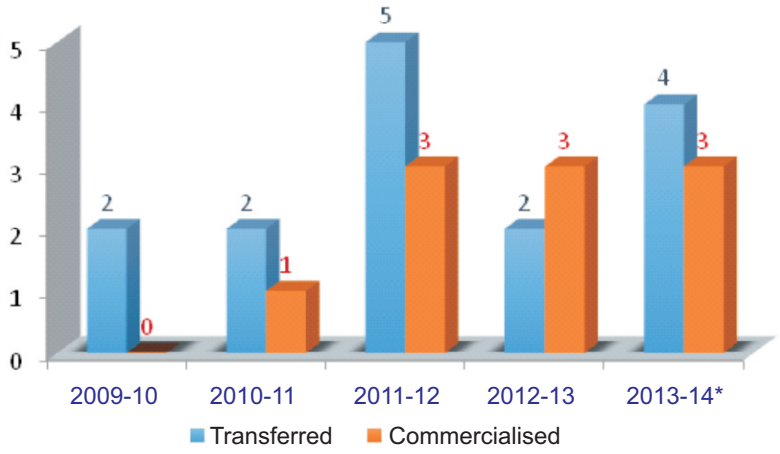
The second of our goal is the effective utilization of the scientific manpower in R&D projects and minimize use of scientific manpower in supporting and managerial activities. We measure this parameter by the man days booked to R&D projects vis-a-vis the total man days available. Towards this, we have set a very stiff target of achieving a manpower utilization factor of 80% by 2016. The trend in manpower utilization booked to R&D projects over the past three years is shown below:



For this financial year, we hope to achieve a project utilization factor of 46-48% by the year end. The decrease in the utilization factor compared to the past two years is because of the significant reduction in the number of Grant-in-Aid Projects (GAP) that is being pursued this year. Earlier, a large proportion of time of scientists was booked to GAP. The flip side of booking man-hours to Grant-in-Aid projects is that it is many a time over-estimated and there is no actual realization of man-hour charges from these projects. On the contrary, actual man-hour charges are realized in sponsored projects. It is going to be a challenging task to secure a large number of industry sponsored projects and a project portfolio that would ensure 80% project time occupancy for all scientists and to reorient a majority of our supporting scientific manpower towards R&D projects. On the equipment utilization front, I am quite concerned at the pace at which we have tried to maximize the utilization of major equipments. Although we have taken some new initiatives, it is far below my expectations and would require a determined effort to change the mindsets and bring in some innovative thinking to firstly evolve a foolproof online equipment time utilization record and thereafter to achieve 80% equipment-time utilization. This would require that the group leaders and Heads of the various Divisions take concerted efforts and evolve plans towards 80% utilization of all major equipments. I must emphasize here that many of my colleagues now share my thoughts on these being national facilities rather than lab

facilities and that there are many more opportunities for the utilization of equipments rather than its mere use in projects. We now have laboratory sessions for AcSIR students where hands on training on several equipments are provided, we allow equipments to be used directly by the industries through their personnel, we conduct training programs on specialized equipments for the industry personnel and we allow their use at discounted rates by the academic institutions and so on. We have also transferred or in the process of transferring some of our sophisticated equipments (Confocal microscope and Hot Isostatic Press) whose use at CSIR-NML were at a sub-critical level to CFTRI, Mysore and CGCRI, Kolkata respectively.

Our focus and relentless eforts on technology development and their commercialization has yielded significant results. In the past six months, two high impact technologies namely "Recovery of lead from zinc plant residue" and "Tungsten powder from tungsten carbide hard metal scrap" were transferred to M/s. Cinkom Zinc Metal Mining Co, Turkey and M/s. Minestone Minerals, Mangalore respectively. The technology on tungsten from secondaries will soon be transferred to another company namely, M/s. LechTech Materials Pvt. Ltd., Hyderabad. Another of our technology on the "Production of high purity nano iron oxide powders from pickle liquor for pigments" will soon be transferred to M/s. Tata Pigments. In the past four years, thirteen technologies have been transferred from CSIR-NML of which ten of them are in commercial production. I hope some of these technologies that have been commercialized will have a lasting impact.



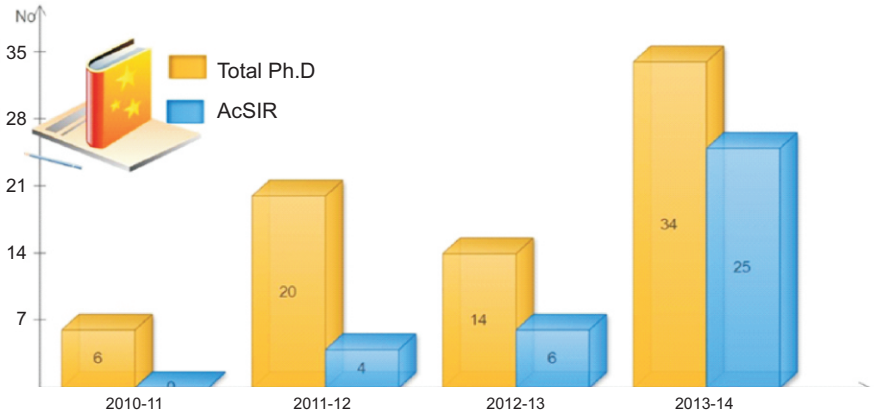
Our efforts towards a paperless CSIR-NML through the implementation of the Enterprise Resource Planning (ERP) have resulted in the partial implementation of the ERP system at CSIR-NML with respect to several processes. NML has been the first CSIR laboratory to go online. We are working on its total implementation by March 2013, the acid test for which would be the on-line balance sheet generation and its reconciliation with the present accounting system (using IMPACT). I should compliment our ERP implementation team for their commendable, painstaking and sustained efforts in implementing the ERP system despite the several hiccups faced periodically.

Our mission mode 12th plan projects have been making good progress. In the project on *"Development of a Cheap and Energy Efficient Magnesium Production Technology"*, the installation and commissioning of the 300 kg Mg pilot plant was completed in August' 2013. Complete CFD modelling (in collaboration with IIT Kharagpur) of the reactor was established to determine the temperature and vacuum profile in the reactor for various power inputs with the addition of charge. Subsequently, four pilot scale campaigns were carried out including a test campaign for curing the lining and testing the condenser. Although there was varying degrees of success in these campaigns, several engineering issues with respect to vacuum leakage and clogging of the pathways remain and a concerted and determined effort has to be put up for the smooth production of Mg using this process.

The 12th plan project on *"Development of Zero Waste Technology for Processing and Utilization of Thermal Coal"* taken up with the aim of developing a dry beneficiation technology for coal and for the gainful utilization of (for pavement blocks & tiles) and recovery of valuables from combustion products (cenospheres, rare/rare earth metals such as Ga, Se, Te, Gd, Nd, Sa etc.), is also on track. Two coal samples have been received, fully characterized and dry processing and optimization studies carried out in an Air Table.

Although the final approval and sanction from Ministry of Steel, on the CRGO project is awaited, three internal projects have been initiated for the design and evaluation of new compositions, design of the thermo-mechanical processing schedule and evaluation and design of new coatings. The results achieved so far in these internal projects will be presented by my colleagues. In addition to Ministry of Steel, Tata Steel, RINL and CSIR are partners in this project. Members from Tata Steel have been actively associated with these internal projects.

Our academic activities and programs under the Academy of Scientific & Innovative Research (AcSIR) has increased many folds. The status with respect to number of students from CSIR-NML registered for PhD in AcSIR and to other reputed institutions over the past four years is shown below :

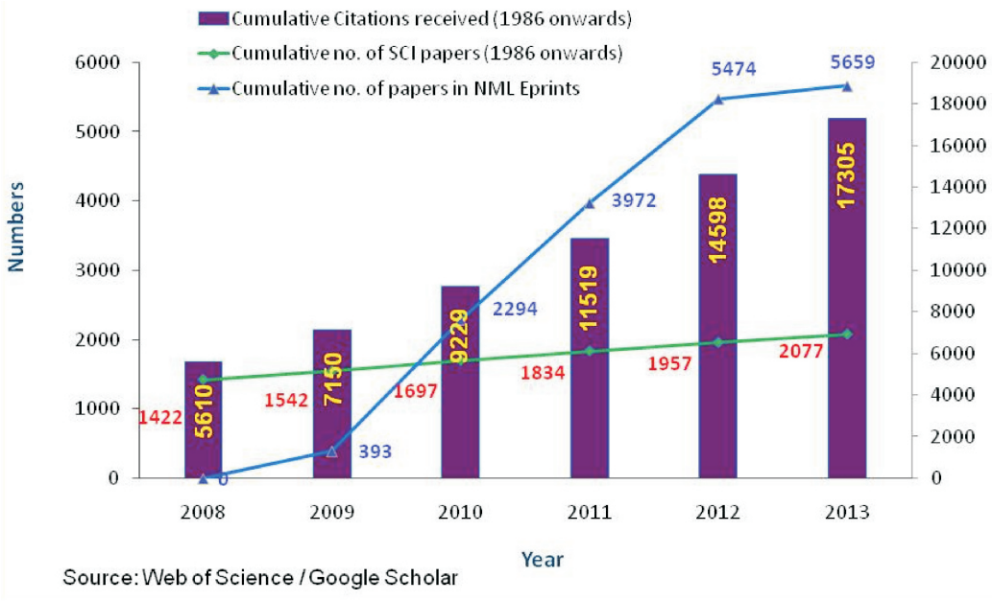


*As on December, 2013

In this academic year, there are twenty five students registered for Ph.D, including industry sponsored candidates, trainee scientists, Junior and Senior Research Fellows, Quick Hire Fellows and some of our younger scientists. This is a substantial increase from last year and this has also necessitated substantial time involvement in teaching for several of us. In keeping with our commitment to pursue research in trans-disciplinary areas under AcSIR, we have introduced some new state of the art subjects such as "Life Cycle Assessment of Materials" and "Integrated Computational Materials Engineering" into the course curriculum. If we have to sustain this momentum in the years to come and maintain high levels of excellence, we have to build systems of excellence and substantial infrastructure. Further, it would be necessary for several of my colleagues to work that extra bit harder to ensure that the time taken up for teaching is not at the expense of taking up and delivering on sponsored projects which will continue to be our source of sustenance. An additional responsibility would be to generate the necessary financial resources for AcSIR through several means such as industry corpus, conduct of short term programs etc.

Our performance in terms of publications in SCI journals remains good. In the last calendar year, we had 120 SCI publications which is close to one SCI publication/Scientist/Year. However, the citations/paper has been exponentially increasing and as on date our citations/paper is 8.33 which is commendable compared to even international standards. We have already surpassed our set target for 2016 with respect to this parameter. This has further substantiated my belief that pursuing industrially relevant projects need not necessarily

compromise either on the number of publications or the academic impact that they create so long as our project portfolio centers around R&D and we invest in our internal research mechanism to give shape to novel scientific ideas. The trend of publications as well as the number of citations received over the past six years is depicted below :

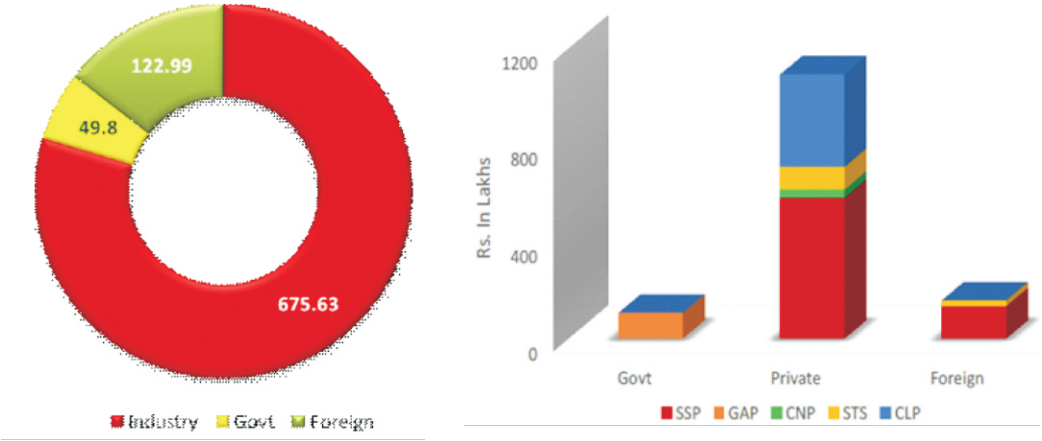


Source: Web of Science / Google Scholar

Considering that we already have about thirty four students registered for PhD and most of them have only started on their research work and that this number is expected to substantially increase in the coming years, my assessment is that achieving the target of 150 SCI publications would be possible without much difficulty.

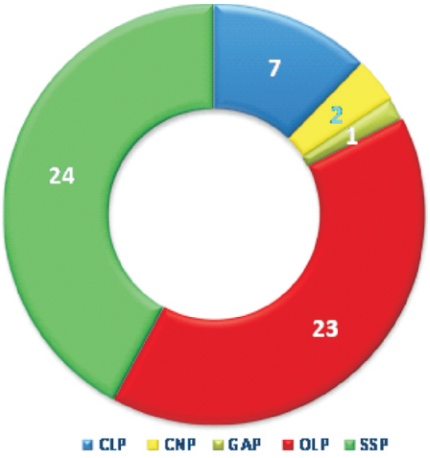
OVERALL PERFORMANCE IN THE PAST SIX MONTHS

The External Cash Flow of CSIR-NML during July to December 2013 and its distribution among the various categories are given below :

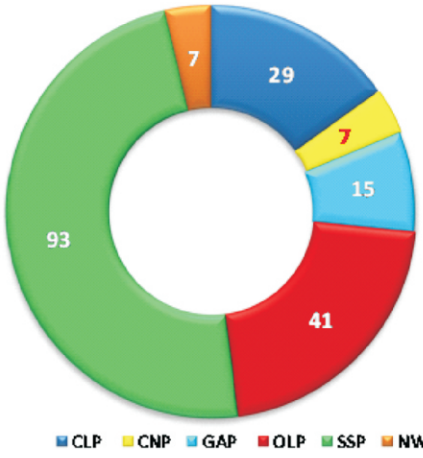


ECF & Their Projectwise Distribution during July-December, 2013

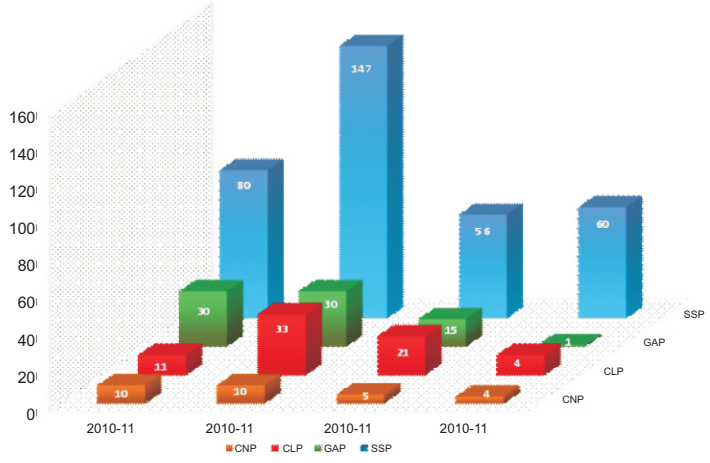
The dominance of industry sponsored projects and their contribution to the external cash flow in recent times rather than the grant-in-aid projects is a healthy trend and reflects the increasing relevance of our work.



New projects Undertaken Jul-Dec 2013: 57



On-going Projects as on December,2013: 192



Projects Undertaken Under Various Categories in The Past 4 Years

Progress in Projects

It is clear that CSIR-NML's project portfolio as well as client portfolio spreads across a diverse spectrum ranging from multi-laboratory CSIR networked projects, mission mode projects on public-private partnership, several collaborative projects with industries especially Tata Steel, a large number of industry sponsored projects, projects sponsored by international clients, projects sponsored by grant-in-aid bodies and other agencies & ministries and some exciting in-house projects. The objectives, deliverables and timelines as well as the current status of all the ongoing projects (192) projects are compiled in the RC agenda document that has been circulated. I wish to specifically highlight some of the major outcomes from these projects in the past six months :

- Joint development of Iron Ore Slime-Jhama coal composite briquette by CSIR-NML-Tata Steel and its Plant trial for use in iron making at M/s. Polybond, Durg
- Development of Iron Ore Slime Briquette as a coolant for LD converter and its plant trials at Tata Steel
- Design and development of annealing simulator for batch and continuous annealing
- Development of a biomimetic process for the synthesis of colloidal collagen-graphite composite

- Development of a novel and cheap process for graphene coated steels
- Development of a flow sheet for the processing of an Ethiopian lean grade goethitic iron ore
- Quality Evaluation of Coal-Cores explored from different regions of India especially Orissa
- Development of technology for recovery of Potash from feldspar with simultaneous recovery of Ferro Silicon

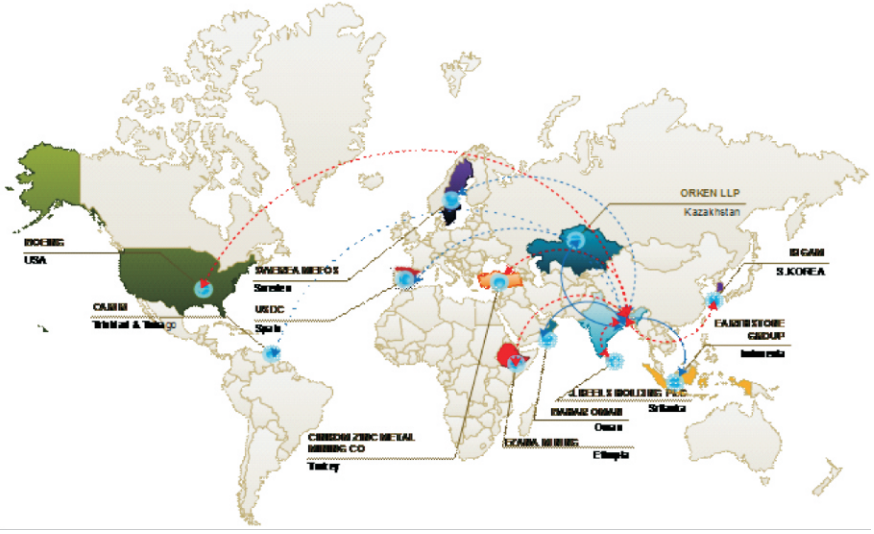
Patents Filed

In the last six months nine patent applications have been filed of which six are jointly with Tata Steel. The patents filed in the past six months are : i) *A biomimetic process for the synthesis of colloidal collagen-graphite composite,* ii) *An improved process for preparation of briquettes for iron making using iron ore slime and jhama coal,* iii) *An improved annealing simulator device,* iv) *A process for production of highly metallised directly reduced iron,* v) *Process for production of highly metallised low sulphur directly,* vi) *A process for synthesizing reduced graphene oxide on a substrate,* vii) *An improved Rayleigh wave ultrasound based technique for detection of cause of residual stress on HSS rolls,* viii) *A sensor based on amorphous or nanostructured magnetostrictive ribbons and a process for non-destructive evaluation of defects in pipelines using the same device,* and ix) *An improved process to produce refractory bricks from ferrochrome slag*.

MoUs/Agreements Signed

Since the last Research Council meeting, a large number of MoUs were signed with various clients including several international organizations. These are : 1) *Non disclosure Agreement*- M/s. John Keells Holdings PLC, 2) *Recovery of lead from zinc plant residue*- M/s. Cinkom Zinc Metal Mining Co, Turkey, 3) *Microstructure characterization of fusion boundary of Fe-Ni based alloy in dissimilar metal weld.- M/s. Bhabha Atomic Research Centre,* 4) *Collaborative projects in Ferroalloys & Stainless steel*- M/s. Shyam Ferroalloy Ltd., Kolkata, 5) *Collaborative projects in Ferroalloys & Stainless steel* - M/s. BRG Iron & Steel Co. Pvt. Ltd., 6) *Preparation of Techno Economic Feasibility Report* - M/s. Mecon Ltd. Ranchi, 7) *Recovery of cobalt from discarded Li-ion batteries of mobile phones* - M/s. ADV Metal Combine Pvt. Ltd. , 8) *Recovery of gold from the scrap parts of telecommunication and medical equipments* - M/s. Eco Recycling Ltd, Mumbai, 9) *Use of Equipment and Facilities of CSIR-NML by TSL personnel* - M/s. Tata Steel Ltd, Jamshedpur, 10) *Tungsten powder from tungsten carbide hard metal scrap* - M/s. Minestone Minerals, Mangalore, 11) *Studies on stress rupture behaviour of alloy 690 material* - M/s. Bhabha Atomic Research Center, Mumbai

International Collaborations



International collaborations during the last year

Our international collaborations, especially with multinational companies have shown a considerable increase over the past four years. In addition to the strong ongoing collaborations with BOEING, KIGAM (Korea Institute of Geosciences Mineral Resources), Swerea MEFOS Sweden, CARIRI, General Electric, Korea Maritime University we are soon signing up agreements with SIEMENS and M/s. John Keells Holdings PLC, Srilanka. We continue to have a strong collaboration with several international academic institutes.

New Infrastructure Added

A number of new equipments have been installed and commissioned in the past six months. These include: (i) Inert Gas Glove Box (ii) Automated Controlled Leaching System (iii) Ash Fusion Character Determination (iv) Laboratory induced magnetic Separator (v) Roller Crusher (vi) Knelson Concentrator (vii) Carbon Evaporator

Awards / Distinctions/ Fellowships/ Received

- ECORECO- INNOVATION AWARD 2013 to Dr. Vinod Kumar, Dr. M. K. Jha, Dr. A. Vidyadhar, Dr. Ratnakar Singh, Dr.Vinay Kumar, Dr. Mamta Sharma, Dr. J. Hait, Dr. S. Chakravarty, Dr. B. D. Pandey, Dr. R. K. Jana and Mr. U. C. Oraon for successful commercial exploitation of the project entitled "Physical and hydrometallurgical beneficiation of poly cracker ash to enrich the metal concentrate"
- Enterprise Resource Planning (ERP) Implementation - Outstanding Achievements Award-2013 to team CSIR-NML for their inspiring institutional leadership demonstrated in championing the transition to an electronic work culture, embracing performance driven evidence based operations & transcending beyond conventional confines
- Dr S. Srikanth, Director, CSIR-NML received the Vasvik award - 2011 in the field of Material and Metallurgical Sciences & Technology
- IIM Metallurgists of the Year 2013 was awarded to Dr. D. Bandyopadhyay, in the Ferrous group, Dr. K.L. Sahoo in the Non-ferrous group and to Dr. Sanjay Kumar in Environment, Energy, Conservation & Waste Management category
- Indian Society for Non - Destructive Testing National NDT Award under the category "Excellence in contribution to Research & Development" for the year 2013 to Dr. N. Parida.
- Shri K K Paul, Chief Scientist and Head, Engg received the Engineering Achievement Award 2013 from the Institution of Engineers (India)
- INS Young Scientist Award 2012 to Dr.Abhilash in the category of Nuclear Fuel Processing.
- AMI Young Scientist Award-2013 in the area of Environmental Microbiology to Dr.Abhilash, for contributions in microbe-metal interactions
- Altekar Award for Best Technology for the Year 2012 - Dr. D Mishra, Dr. K K Sahu, Dr. R K Jana, Dr. S K Sahu, Mr. N S Randhawa, Mr. J N Patel and Dr. B D Pandey
- B R Nijawan Best Paper Award 2012- Dr. Sabita Ghosh and Dr. G Das
- Shilowbhadra Banerjee Award - Mr. C Soupramanien, Mr. K K Paul, Dr. S Sivaprasad, Dr. Tarafder and Dr. N Narasaiah
- P. Ramachandra Rao Award - Mr. K Seetharaman and Mr. Goutam Banerjee (Technical Category), Mr. K G Simon and Mr. T K Pal (Non Technical Category) received the award for Best Employee.
- CSIR-NML participated in the Annual flower show and won a total of thirteen Prizes in Different Categories in the 25th Annual Flower show organised by Tata Steel, JUSCO and Horticultural Society, Jamshedpur.

In addition, several scientists of CSIR-NML received prizes for best oral and poster presentations in several of the national conferences.

Distinguished Visitors

- Mr Supravat Mondal from M/s TUV SUD, delivered an "Awareness Lecture on EMS 14001 & OHSAS 18001" in July 2013.
- Dr. Pijush Pal Roy, outstanding Scientist, CSIR-CIMFR, delivered a lecture on "Emerging Techniques of Rock Blasting: Effects and Operations".
- Dr.Stephen Gaydos, Scientist, Boeing, USA, delivered a lecture on "Overview on Boeing's Coating Programme" in Oct 2013.
- Dr. Omprakash, Scientist, Boeing, INDIA, delivered a lecture on "Overview of Boeing's R&D activities in India" in Oct 2013.
- Prof. Sushanta Dattagupta, Vice Chancellor, Visva Bharati University, Shanti Niketan (Kolkata) , delivered a lecture on "DIFFUSION" in Oct 2013.
- Dr. Sanjay Sondhi, GE, Bangalore, delivered a lecture on "Computational Materials Science: An Industrial Perspective" in Oct 2013.
- Shri Bhogla Soren, Vigilance Officer, BSNL Jamshedpur, delivered a lecture on Vigilance Handling.
- Prof. Anil K Gupta, Indian Institute of Management, Ahmedabad Coordinator, SRISTI Founder, Honey Bee Network Executive Vice Chair, National Innovation Foundation, delivered a lecture on "Grassroot Innovation" in Nov 2013.
- Shri B. L. Shah (Retired), Ex- Head and Scientist In-charge, Central Institute of Mining and Fuel Research (CIMFR), Bilaspur, delivered a lecture on "Utilization of Coal" in Nov 2013.
- Prof. Vikram Jayaram, Chairman & Professor, Department of Materials Engineering, Indian Institute of Science, Bangalore, delivered a lecture on "Microscale mechanical testing of Pt-Ni-Al bond coats on Superalloys" in Dec 2013.
- Dr. Sourav Das Principal Researcher, High Strength Steel, R D & T Division, Tata Steel Europe, delivered a lecture on "Development of Third Generation AHSS: A Tata Steel Approach" in Dec 2013

Foreign Depution

- Dr. Amitava Mitra, MST was deputed to Nepal in July 2013 to attend NAST- CSIR collaborative workshop.
- Dr. Sanjay Kumar, MEF was deputed to Hungary during in July 2013 under the Indo-Hungarian Bilateral Staff Exchange Programme.
- Dr. B. Nayak, MNP was deputed to Germany during Aug-Oct 2013 for Postdoctoral research work under Humboldt Fellowship.
- Dr. A. K. Mohanty, CSE was deputed to Germany during Aug - Nov 2013 under CSIR- DAAD Exchange Fellowship 2013.
- Dr. M. M. Humane, MEF was deputed to Belgium during Oct 2013 to Jan 2014 under the Raman Research Fellowship.
- Dr. V. C. Srivastava, MEF was deputed to Germany during Sep 2013 to attend 5th International Conference on "Spray Deposition and Melt Atomization (SDMA- 2013)".
- Dr. Sanjay Kumar, MEF was deputed to Malaysia during Nov 2013 to attend International conference on "Waste to wealth".
- Dr. Shobhna Dey, MNP was deputed to South Africa during Nov 2013 to attend 6th International Conference "Flotation- 13" and visit to University of Cape Town, South Africa.
- Dr. Manis Kumar Jha, MEF was deputed to South Korea during Nov-Dec 2013 for Project Discussion and Meeting related to Korean Interns

Human Resources

The following people have joined the laboratory in the past six months :

Smt. Chanchala Mukhi, MTS , Dr. Shantanu Vijay Madge,Principal Scientist, Dr. Atish Kumar Ray,Senior Scientist, Mr. Ranjit Sandilya- Assistant (G) Gr.I

Three employees retired in the past six months. They are - Sri A.A. Bhattacharjee- Asstt.(G) Gr.I, Dr. D.D.N. Singh, Chief Scientist, Sri Laliteswar Singh, Principal Technical Officer

One CSIR Enterprise Resource Portal (ERP)

During the last six months all the prerequisite data entry has been completed in Human Resources module for e-service books and is fully functional. Presently most of the employee self-services like GPF, children education allowance, leave, loans & advances, medical and telephone reimbursement, monthly pay bill of employees etc. are through on-line processes. Remaining on-line self service functions like travelling allowances, LTC etc. will be made operational soon. Employee role mapping activities have been completed and all employees are mapped with projects. Budget allocation to all notional projects has been made to facilitate the ERP work flow. The necessary inputs/documents on ongoing projects have been uploaded in the ERP system.

Presently the project receipts for the FY: 2013-14 are being processed in CVR. Revised version of Materials Master Module (i.e. Stores & Purchase Module) has been deployed recently. Under this version, a new set of category & sub-category has been frozen for entering and mapping items. Items entered in the old version are being migrated to the new version for updating the list of items for raising an indent. Indents are being raised as per new, version of category & sub-category. Manual Purchase Order is also being generated. Online submission of FVC for payments is being done. DRR entry for generating SRV etc. has been tested. With regard to Infrastructure Engineering and Service module, the passed Works and Services bill, Security deposit bill, Earnest Money bill and Service Tax Reimbursement Bill for Financial Year 2013-2014 has been raised in the prescribed FVC Bill Format as per ERP Procedure. The on-line request for works has also been raised through the ERP system. In Finance and Account module Work with respect to entering all the past transactions through FVC has been completed. Presently all the bills are getting processed Online through ERP system except IR bills, TA, LTC, CENVAT Credit etc. These would soon be switched over for online processing. At present validation of data entered through ERP is under progress.

MAJOR EVENTS & NEW INITIATIVES

International Conference on Science and Technology of Ironmaking and Steelmaking (STIS 2013).

The Conference was Jointly Organized by CSIR-NML, TATA STEEL & IIM, Jamshedpur Chapter. Mr. A M Mishra, Former Vice President of Tata Steel was Chief Guest and Professor

Roderich LL Guthrei, Director McGill Metals Processing Centre, McGill University, Canada was Guest of Honour. The objective of the conference was to share knowledge available within the country and from abroad on different aspects of iron and steel making so as to achieve conservation of raw materials, utilization of fines and wastes, sustenance in energy and environment in iron and steel sector.

School-NML Interactive Programme (SNIP)

Over the past two years, more than 9000 students from 105 schools along with their teachers have already participated in the programme and derived the benefits. The programme has been designed to give the students an exposure to modern laboratory conditions and to inspire students to pursue a career in science.

Under the program, CSIR-NML has also helped 35 schools to set up science clubs in their campus to ensure that budding young minds who earlier visited the laboratory maintain their focus and develop a passion towards science. As a part of the initiative, the laboratory also shared science literature and expert advice in putting up the science club. The concerned school faculties were given counseling for the maintenance of the clubs. As a result, most of the participating schools have now initiated the organization of annual science exhibition wherein their students prepare science models, posters and different types of displayable materials and showcase them.

imagination of the students and teachers in this region and has received appreciation from a cross section of society, including schools, press, District Education Dept. and public at large.

Teacher-CSIR-NML Interactive Programme (TECNIP)

The proposal of District Education Officer, East Singhbhum for carrying out a capacity building exercise for about 200 Government school Science teachers across the district has been undertaken. The first phase comprised of a day-long orientation session which included motivational lectures towards fundamental science, information on ways to upgrade school infrastructure and insights into recent scientific developments. Already more than 180 teachers across East Singhbhum district in four batches have undergone the program. The second phase, however, has been planned for a two to three day subject oriented residential training

programme at the laboratory which is planned for April 2014.

Industry sponsored students-NML Interactive Programme (INDSS-NIP)

CSIR-NML has initiated an interactive programme with Industry sponsored students deputed by academic institutes. Under this programme, students from Aditya Institute of Technology, Adityapur representing different sponsored Industries (Tata Steel Ltd.; Alfa Motors Mahindra & Mahindra; RSBT Ltd.; Brakes India Ltd.; JMT Auto Ltd.; Ramkrishna Forging Ltd.; Tata Consultancy Engineering Ltd.; Tayo Rolls Ltd.; RSB Transmission India Ltd.; Kross Manufacture Ltd. and Adhunik Alloys & Power Ltd.) visited CSIR- NML on 18th Oct 2013 and interacted with the scientists. The industrial students were deeply motivated and delighted with the exposure to NML expertise and facilities. The participants expressed their happiness over the laboratory visit and suggested further interaction in near future.

I take this opportunity to thank the Chairman and members of the Research Council for their valuable guidance and unstinted support. I also take this opportunity to express my gratefulness to all my colleagues at CSIR-NML who have aligned themselves with our Vision and direction and worked tirelessly in achieving the goals and targets.

(S. Srikanth)
DIRECTOR

6th February 2014